

Application No.
Amendment Dated 6/29/2005
Reply to Office Action of 10/613,708

In the drawings:

Please substitute the enclosed replacement sheet of FIG. 6 for the corresponding sheet originally submitted with the application.

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Remarks/Arguments

Claims 1, 3-11, and 13-24 are presently pending. Claims 2 and 12 are canceled. Claims 1, 3, 4, 8, 9, 10, 11, 13-16, and 19-22 are currently amended. Claims 23 and 24 are new.

Claims 1-2, 8-12, 14, 16 and 19-21 were objected to because of various informalities. The claims have been generally amended in conformance with the Examiner's recommendations in the Office Action with the following minor exceptions. Claims 2 and 12 were canceled and incorporated into claims 1 and 11, respectively. In claim 8, the reference to "the determined hydraulic flow rates" was changed to "the hydraulic flow rates" for clarity. Claims 9 and 10 were amended to depend on claim 8 and to recite "the error feedback being consistent with the applied corrective force." Accordingly, Applicant requests the withdrawal of the claim objections.

Claims 1, 8-11, and 19-22 were rejected under 35 U.S.C. 102(b) as being anticipated by Bach et al. (U.S. Pat. No. 5,257,177). This rejection is traversed for the following reasons.

Bach discloses a hydraulic control system for moving a length-adjustable and pivotable arm along a generally linear path, such as a vertical path. (Col. 1, lines 7-10; Col. 1, lines 47-50) This vertical motion may be useful for hydraulic systems that are used in forklifts and cranes, for example. (See Col. 1, lines 44-55.) In Bach, each drive unit has a position sensor "which detects the position of the piston inside the cylinder." (Col. 10, lines 7-9.) The control system controls a length *l* of the arm and angles *A* and *B* of the arm (shown in FIG. 2) to achieve the generally linear path (e.g., of a fork 9 of a forklift truck 1). (Col. 10, lines 2-4; Col. 10, lines 22-32.) Angle *A* represents the angle between the arm and the carrier 4, whereas angle *B* represents the angle between the arm 8 and the fork 9. (Col. 10, lines 2-4.) The movement of the arm along a later subsection may be stopped if a previous subsection of the path is not compliant with a desired path. (Col. 2, lines 52-58; Col. 15, lines 55-64.)

In contrast to Bach which limits the path of an arm to a generally linear path (Abstract; Col. 1, lines 9-10; Col. 10, lines 25-27; Col. 11, lines 34-36), claim 1 now recites that the desired path is "selected from a library of target paths to avoid at

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least one of joint limit, a singularity, an obstruction or an efficient movement." Similarly, claim 11 recites that a desired path of the mechanical arm is "among a library of target path plans to avoid at least one of a joint limit, a singularity, an obstruction or an inefficient movement." The path of Bach is tailored toward a generally linear or rectilinear path for a fork of a forklift, whereas "the desired path" of claim 1 has no such limitation or restrictive application.

Further, claim 1 calls for "measuring an actual path segment of the actual path of the mechanical arm through one or more velocity sensors associated with corresponding joints of the mechanical arm." Similarly claim 11 calls for "the position sensor comprising a velocity sensor associated with a corresponding joint of the mechanical arm." Bach lacks the **velocity sensors associated with corresponding joints of the mechanical arm**. Bach does not teach or suggest such a limitation. Instead, Bach merely discloses position sensors **that detect the displacement of a hydraulic piston with respect to its cylinder** to derive a position and orientation of a fork. (Column 10, lines 7-14.) The position estimate of Bach is derived from the displacement of a hydraulic piston, as opposed to one or more velocity sensors associated with a corresponding joints of the arm.

Claim 1 and claim 11 now recite that "the corrective force" comprises "an orthogonal corrective vector orthogonal to a progress vector of the mechanical arm consistent with the actual path segment." In contrast, rather than correcting a deviation from the desired path with a corrective force that includes an orthogonal corrective vector, Bach results in a stopping of the movement of arm where a previous subsection is not compliant with a desired position. Although the stopping may be suitable for a crane or lift to prevent deviation from a generally linear path, such restrictive operation might cause unnecessary disruptions and loss of productivity where the desired path is not restricted to a generally linear path. The Office Action, dated 3/22/05, stated that the orthogonal corrective vector and the progress vector were not disclosed in Bach, and the Office Action cited no other reference that describes the claimed correction scheme with an orthogonal corrective vector.

For the foregoing reasons, Applicants respectfully request the withdrawal of the section 102 rejection of claims 1 and 11. Further, because claims 3-10 and 23, depend upon claim 1, claims 3-10 and 23 are patentable for at least similar reasons

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to claim 1. Claims 13-22 and 24 are patentable for at least similar reasons to claim 11.

Claims 2-7 and 12-18 were rejected under 35 U.S.C. 103(a) as being unpatentable over Bach. This rejection is respectfully traversed for the following reasons.

The Bach reference has been described above with reference to claims 1 and 11, which now incorporate the limitations of claim 2 and 12, respectively. As previously noted herein, Bach lacks the following claimed features: (1) the library of target paths to avoid a joint limit, singularity, an obstruction, or inefficient movement, (2) one or more velocity sensors associated with joints of the arm, and (3) the application of a corrective force comprising an orthogonal corrective vector orthogonal to a progress vector of the arm. Additional modifications to Bach would be required to meet claims 1 and 11 because of the above claimed features. Further, such additional modifications are neither taught, nor suggested by Bach. Bach fails to teach applying a corrective force to the arm with the orthogonal corrective vector. In addition, Bach teaches not applying any corrective force to the arm, "if the work equipment is not in the desired position at the end of a subsection" of the actual path. (Col. 2, lines 52-58.)

For the foregoing reasons, Applicants respectfully request the withdrawal of the section 103 rejection of claims 1 and 11. Further, because claims 3-10 and 23, depend upon claim 1, claims 3-10 and 23 are patentable for at least similar reasons to claim 1. Claims 13-22 and 24 are patentable for at least similar reasons to claim 11.

Additional claim amendments were made to claims 3, 4, and 13-15 to provide proper antecedent basis and better form in support of previously discussed changes to the claimed language of claims 1 and 11. The additional claim amendments to 3, 4 and 13-15 were not made to overcome any cited prior art.

The Applicant has submitted a replacement sheet for FIG. 6. The enclosed replacement sheet for FIG. 6 changes "servo-value" to "servo-valve" to correct a typographical error, consistent with the specification. No new matter or other changes are made in revised FIG. 6. Applicant requests the Examiner's approval of the change to the drawing.

In conclusion, it is believed that this application is in condition for allowance,

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and such allowance is respectfully requested.

Any fees or charges due as a result of filing of the present paper may be charged against Deposit Account 04-0525.

Respectfully,



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